

## Unit 6 Review

**In addition to knowing vocab definitions, be sure you can apply them to understand the following:**

### Ch 13

- DNA is the Genetic Material
  - What was the contribution of each of the following scientists to the field of molecular biology?
    - Be able to explain what they did in their experiments in addition to what they concluded
      - Morgan
      - Griffith
      - Avery
      - Hershey and Chase
      - Chargaff
      - Wilkins and Franklin
      - Watson and Crick
      - Meselson and Stahl
  - What is the structure of DNA? Explain in terms of
    - Components of a nucleotide
    - Sugar phosphate backbone, antiparallel, double helix
    - Nitrogenous bases, base pairing rules, purines vs pyrimidines
- DNA Replication
  - What is the difference between the conservative, dispersive, and semiconservative models of replication?
    - Which one is correct and how was this determined?
  - What is the role of each of the following proteins/enzymes in DNA replication?
    - Helicase
    - Single-strand binding proteins
    - Topoisomerase
    - Primase
    - DNA polymerase
    - Ligase
  - What would happen if a certain enzyme was not working correctly (due to mutation, etc.)?
  - How does replication differ in prokaryotes vs eukaryotes?
  - How does the antiparallel structure of the double helix affect replication?
  - What is the difference between the leading vs lagging strand?
- DNA Repair
  - What can damage DNA?
  - What is the role of nuclease?
  - What are thymine dimers and how are they repaired?
  - What are the significance of telomeres and telomerase?
- Packing
  - How do chromosomes fit in the nucleus?
  - What if the cell did not produce histones?
  - What is the difference between heterochromatin and euchromatin?
    - Why do chromosomes become more condensed at times and looser at others?

- Genetic Engineering
  - What are some applications of genetic engineering?
  - What are plasmids and why are they useful?
  - How is recombinant DNA created?
  - How do restriction enzymes work?
  - What is the purpose of gel electrophoresis and how does it work?
    - If you know the restriction sites on a segment of DNA, how would the fragments appear in the gel once separated?
  - How can multiple copies of genes AND target segments of DNA be produced?
  - What steps are involved in PCR and why is Taq polymerase key to PCR?

**Note: Your free-response questions will focus on information learned from the Biotechnology Labs. Be sure to review the backgrounds, procedures, and results from those labs!**

## Ch 14

- General
  - How are DNA and RNA different?
  - What is the function of mRNA vs rRNA vs tRNA?
  - What applications result from knowing that genetic code is essentially the same for all organisms?
  - What is the significance of the fact that the flow of information from gene to protein is based on a triplet code?
  - Given a sequence of DNA, be able to determine the
    - Codons, anticodons, and amino acids (given a table of codons)
  - Given amino acids, be able to determine the
    - Anticodons, codons, and template strand of DNA
- Transcription vs Translation
  - What is the purpose of each of these processes?
  - Where do they occur in the cell?
  - How do these processes differ in prokaryotes vs eukaryotes?
- Transcription in more Detail
  - What enzyme catalyzes RNA synthesis and how does it work?
    - Know direction and complementary bases
  - What are the functions of promoters, terminators, and transcription factors?
- RNA Processing
  - How are the ends of mRNA altered?
  - What purpose do these modifications serve?
  - How does RNA splicing affect the mRNA molecule?
  - What is the significance of alternative RNA splicing and how is it carried out?
- Translation in more Detail
  - What is the relationship between codons, anticodons, and amino acids?
  - How does tRNA act as a translator?
    - How does aminoacyl-tRNA synthetase aid in translation?
  - What happens at each of the ribosomes three binding sites for tRNA ?

- Post-Translational Modifications
  - How are proteins modified after translation?
  - How are proteins directed to the ER or secreted?
- Mutations
  - What is the difference between the following point mutations?
    - Silent
    - Missense
    - Nonsense
  - Which is typically the most severe and why? The least severe?
  - How do insertions and deletions affect the reading frame and why are they significant?

## Ch 15

- Prokaryotic Gene Expression
  - What is the advantage to altering gene expression in response to the environment?
  - What is the difference between feedback inhibition and gene regulation?
  - How does an operon work?
  - What are the functions of repressors/corepressors vs inducers?
    - What if they are not working?
  - What is the difference between a repressible operon vs an inducible operon?
    - Are they usually on or off?
    - How is this reversed?
    - In what pathways do they generally function?
    - What are examples of each type of operon?
  - What is the difference between negative and positive gene regulation?
- Eukaryotic Gene Expression
  - How are genes differentially expressed in eukaryotes?
  - How does chromatin structure affect gene expression?
    - How does histone acetylation vs methylation affect chromatin structure (and also gene expression)?
  - How does DNA methylation affect transcription?
  - What is epigenetic inheritance and what are some examples?
  - What is the role of transcription factors?
  - How do activators and repressors influence transcription?
  - What are some post-transcription regulation mechanisms and how do they work?
  - What are the function of noncoding RNAs?
  - How do prokaryotic and eukaryotic gene expression differ?